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Can ECG-gated multi-detector computed tomography provide accurate anatomical and functional information in mitral valve regurgitation?

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Purpose: ECG-gated Multidetector Computed Tomography (MDCT) is widely used for coronary imaging, including preoperative appraisal of patients with valvular disease. We aimed to evaluate its ability to provide additional valvular information in mitral regurgitation (MR).

Methods: Consecutive MDCTs performed for coronary assessment in 29 patients with MR were reviewed. Mitral valves were analyzed in multiphase imaging using a standardized protocol. Four types of multiplanar reconstructions were tested: axial, short-axis slices, and from the three-chamber view slices positioned either parallel or rotating around the centre of the aortic valve. We defined motion as normal, prolapse or restriction, noted the most effective phase and calculated the regurgitant volume as the difference between left and right ventricular ejection volumes. Echocardiography was used as a reference for leaflet motion, functional quantification using effective regurgitant orifice (ERO) and ventricular volumes.

Results: The severity of MR, derived from ERO, was graded 1 for 11 patients, 2 (3 patients), 3 (7) and 4 (8). The motion agreement (Kappa coefficient) for the 174 scallops studied was 0.91 (95% CI 0.83-0.97) for the three-chamber-derived views, 0.88 (0.79-0.96) for the axial slices and 0.60 (0.46-0.74) for the short-axis plane. However, the latter was efficient in prolapsed scallops (Se 0.87, Sp 0.98, PPV 0.87 and NPV 0.98). The MDCT RV differed between grades 1 and 3, 1 and 4 (p=0.001), 2 and 3, 2 and 4 (P<0.03) with a gradual increase. No overlap was observed between mild to moderate (1 and 2) and moderate to severe (3 and 4) groups, with a specific threshold ranging from 44 to 47 ml. The most effective phase was 30% in 79% of cases and 20% in the remaining 21%.

Conclusions: MDCT is an accurate tool for evaluating both anatomical and functional parameters of mitral regurgitation. Three-chamber-derived slices and short-axis views allow when combined a reliable interpretation of MR mechanism.

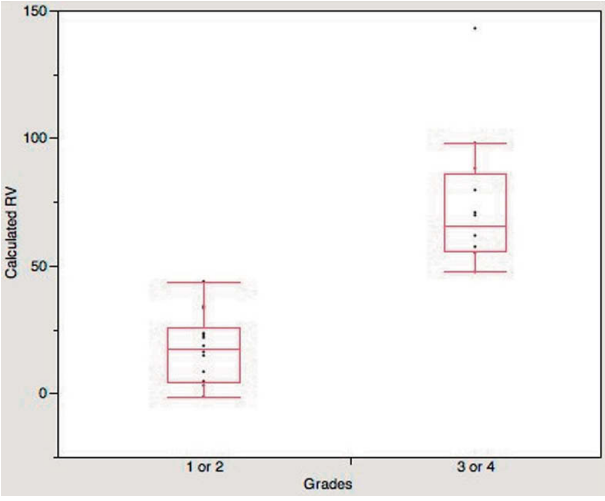

Figure – MDCT RV according to echographic grade

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Non-invasive coronary flow reserve predicts response to exercise in asymptomatic severe aortic stenosis

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In patients (pts) with asymptomatic aortic stenosis (AS), exercise stress echocardiography (ESE) provides additional prognostic information beyond baseline. The coronary flow reserve (CFR) is impaired in AS but its link with exertion is missing in this setting. We hypothesize that CFR could predict exercise capacity and an abnormal exercise test in AS.

Methods: non-invasive CFR and symptom limited semi-supine exercise stress echocardiography (ESE) were performed the same morning in 20 consecutive pts with asymptomatic isolated severe AS (mean age 69±12 years, 30% women, mean aortic valve area 0.8±0.1 cm², mean LVEF 70±6%). CFR was performed in the distal part of the left anterior descending artery using intravenous adenosine infusion (140 µg/kg/min over 2 min). An abnormal ESE was defined as onset of symptoms at less than 80% of maximum predicted workload, ECG ST-segment depression ≥2 mm during exercise, rise of systolic blood pressure < 20 mmHg or fall in blood pressure, complex ventricular arrhythmia.

Results: when compared to pts with normal ESE, pts with an abnormal ESE (n=9) were older, had higher left atrial volume index (all, p≤0.05), and lower CFR (2.1±0.3 vs. 2.9±0.7, p≤0.01), whereas resting hemodynamic variables assessing AS severity were not significantly different between subgroups. Furthermore, CFR was significantly correlated to age, the change of transvalvular pressure gradient and LVEF with exercise, workload (in watts), and exercise duration (all, p<0.05). After adjusting for age, and sex, CFR remained significantly correlated to exercise duration and workload (all, p<0.05). Using a ROC curve analysis, a CFR < 2.17 was the best cut-off to predict an abnormal ESE with a sensitivity of 67%, a specificity of 90% (AUC=0.8, p<0.01).

Conclusion: In pts with asymptomatic severe AS, non-invasive CFR is correlated to exercise duration and workload, and a low CFR predicts an abnormal ESE with a good accuracy.

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Relationship between left ventricular obstruction, left ventricular shape and mitral angle in patients with hypertrophic cardiomyopathy: a cardiac magnetic resonance imaging study

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Purpose: Hypertrophic cardiomyopathies (HCM) are often associated with left ventricular (LV) outflow tract obstruction, which can explain symptoms. The aim of our work was to study the relation between LV obstruction and LV shape.

Methods and results: 36 patients with HCM who underwent cardiac magnetic resonance imaging (CMR) were retrospectively included. Clinical diagnosis of HCM was based on the demonstration by bi-dimensional transthoracic echocardography (TTE) of a hypertrophied and nondilated LV (wall thickness >15 mm) in the absence of another disease capable of producing a similar degree of hypertrophy. Obstructive HCM was defined by a LV outflow gradient >30 mmHg at rest. LV shape and mitral angle were assessed by CMR. Tricuspid – mitral angle (TMA) and LV – mitral angle (LVMA) were defined by the angle between the tricuspid annulus and the mitral annulus, and the angle between the LV axis and the mitral annulus in the 4-chamber view respectively. Mitral papillary muscles angle (MPMA) was defined by the angle between both mitral papillary muscles and the center of the LV in the LV short axis view. There were 20 (56%) men and the mean age was 55±14. There were 24 (67%) patients with obstructive HCM with a mean LV outflow tract gradient of 90±46 mmHg. TMA, LVMA and MPMA were smaller in obstructive HCM patients than in non-obstructive HCM patients (7±3 versus 11±4°, p<0.001; 79±5 versus 87±7°, p=0.007 and 126±14 versus 140±13°, p=0.015 respectively). In the overall population, there was a negative linear

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